TFT LCD Preliminary Specification

MODEL NO.: HC420EF-C22

Customer:_____

Approved by:_____

Note:

Approved By		Date:
Reviewed By		Date:
Prepared By		Date:

CONTENT

DESCRIPTION

The following specifications are applied to the following Hisense module.

Product Name: HC420EF-C22

General Specifications

Effective Display Area	:(H)930.24×(V)523.26	(mm)
Number of Pixels	:(H)1920×(V)1080	(Pixels)
Pixel Pitch	:(H)0.1615×(V)0.4845	(mm)
Color Pixel Arrangement	: R+G+B Vertical Stripe	
Display Mode	: Transmissive Mode Normally Black Mode	
Top polarizer Type	: Anti-Glare	
Number of Colors	: 16.7M	(colors)
Viewing Angle Range	: Viewing angle free R/L 176 (Typ.), U/D 176 (Typ.)	(CR≥20)
Back Light	: 12 CCFL	
External Dimensions	:(H)983.0×(V)576.0×35.1	(mm)
Weight	: 11.5	(Kg)

1. ABSOLUTE MAXIMUM RATINGS

1.1 Electrical Absolute Maximum Ratings

The following items are maximum values which, if exceeded, may cause faulty operation or damage to the LCD module.

(1)TFT Module

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol			Unit	Note
		Min.	Max.		
Power input Voltage	V_{LCD}	-0.3	14.0	V [DC]	at 25±2℃
Operating Temperature	T_{OP}	0	50	℃	Note 1,2
Storage Temperature	T_{ST}	-20	60	℃	
Operating Ambient Humidity	H_{OP}	10	90	%RH	
Storage Humidity	H_{ST}	10	90	%RH	

Notes : 1) Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 °C Max. and no condensation of water.
2) Gravity mura can be guaranteed under 40℃ condition.

1.2 BACKLIGHT UNIT

Table 2. BACKLIGHT UNIT

ITEM	Symbol			Unit	Note
		Min.	Max.		
Lamp Voltage	Vw	-	3000	V_{RMS}	

2. INITIAL OPTICAL CHARACTERISTICS

The following optical characteristics are measured under stable conditions. It takes about 30 minutes to reach stable conditions. The measuring point is the center of display area unless otherwise noted. The optical characteristics should be measured in a dark room or equivalent state.

Measuring equipment：SR-3 and LIPS

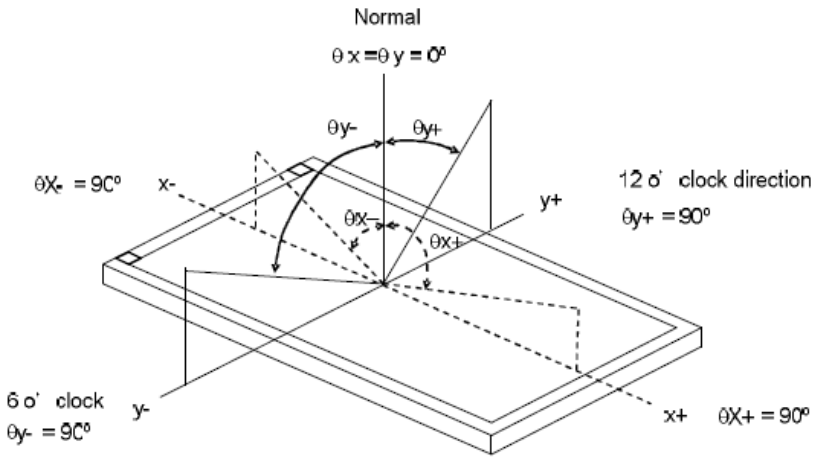
Ambient Temperature=25±2°C, V_{LCD}=12.0V, f_V=60Hz, Dclk=74.25MHz V_{BR_A}=1.65V, $EXTV_{BR\_B}$=100%

Table 3. OPTICAL CHARACTERISTICS （TBD）

ITEM		SYMBOL	CONDITION	Min.	Typ.	Max.	UNIT	NOTE
Contrast		CR	θx=0°, θy=0° viewing angle at normal direction 1)	2000	6000	-	-	2)
Response Time		Gray to gray		-	6.5		ms	3)
Brightness of white		Bwh		-	450	-	Cd/m^2	
Brightness uniformity		Buni		-	-		%	4)
Color Chromaticity (CIE)	Red	x			0.6382		-	[Gray scale=255]
		y			0.3228			
	Green	x			0.2934			
		y			0.6012			
	Blue	x			0.1471			
		y			0.0537			
	white	x			0.2921			
		y			0.2998			
Variation of Color Position (CIE)	Red	Δx		-	-	0.04	-	[Gray scale=255] 5)
		Δy		-	-	0.04		
	Green	Δx		-	-	0.04		
		Δy		-	-	0.04		
	Blue	Δx		-	-	0.04		
		Δy		-	-	0.04		
	white	Δx		-	-	0.04		
		Δy		-	-	0.04		
	Color Gamut	C.G			72		%	NTSC
Viewing Angle	Horizontal	θx+	CR≥20		88		Deg.	Note (1)
		θx-			88			
	Vertical	θy+			88			
		θy-			88			

Note (1) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by Eldim EZ-Contrast 160R



Note (2) Definition of Contrast Ratio (CR):

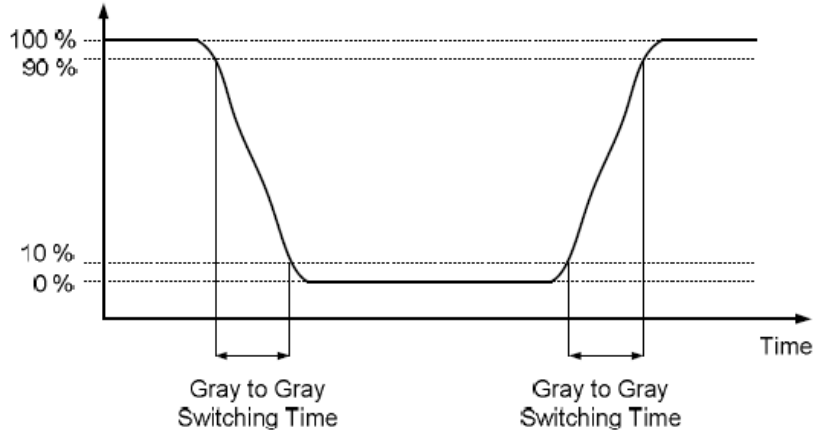
The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (6).

Note (3) Definition of Gray-to-Gray Switching Time:

Optical Response



The driving signal means the signal of gray level 0, 31, 63, 95, 127, 159, 191, 223 and 255.

Gray to gray average time means the average switching time of gray level 0, 31, 63, 95, 127, 159, 191, 223 and 255 to each other.

Note (4) Definition of Luminance of White (L_C, L_{AVE}):

Measure the luminance of gray level 255 at center point and 5 points

L_C = L (5), where L (X) is corresponding to the luminance of the point X at the figure in Note (6).

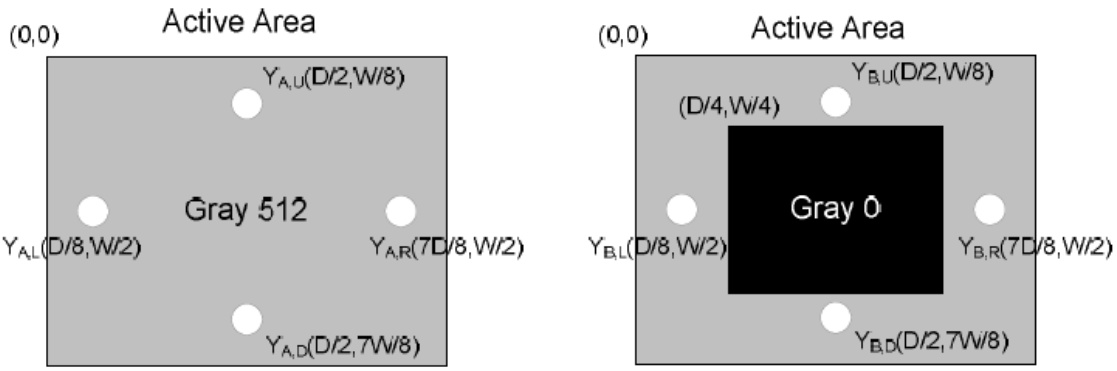
Note (5) Definition of Cross Talk (CT):

CT = | YB – YA | / YA × 100 (%)

Where:

YA = Luminance of measured location without gray level 0 pattern (cd/m2)

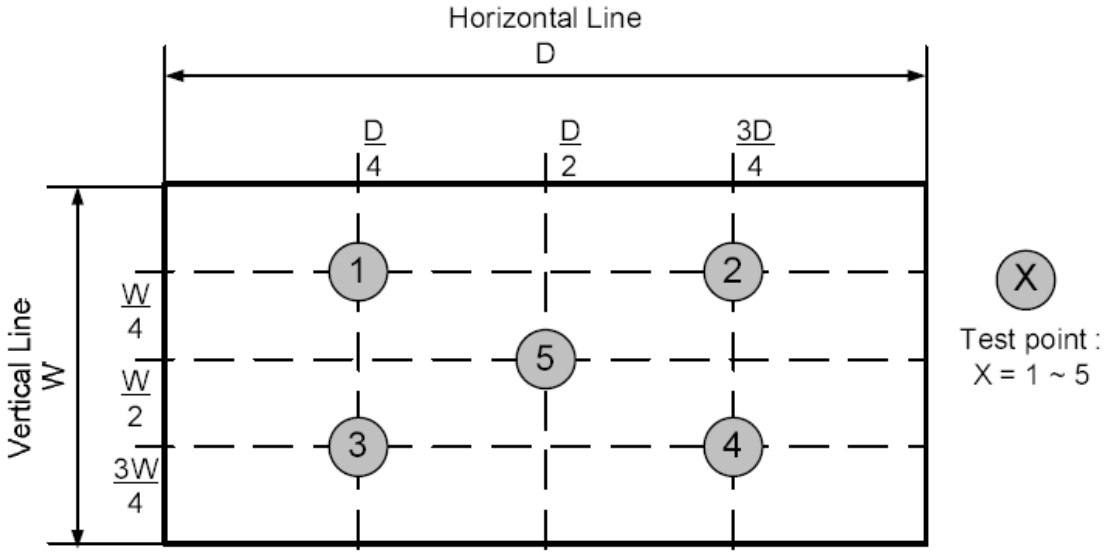
YB = Luminance of measured location with gray level 0 pattern (cd/m2)



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]



Note (7) ECO mode:

ECO mode was selected by inverter pin: A_DIM.

3. ELECTRICAL CHARACTERISTICS

3.1 TFT-LCD Module

Table4. ELECTRICAL CHARACTERISTICS

(Ta = 25 ± 2 °C)

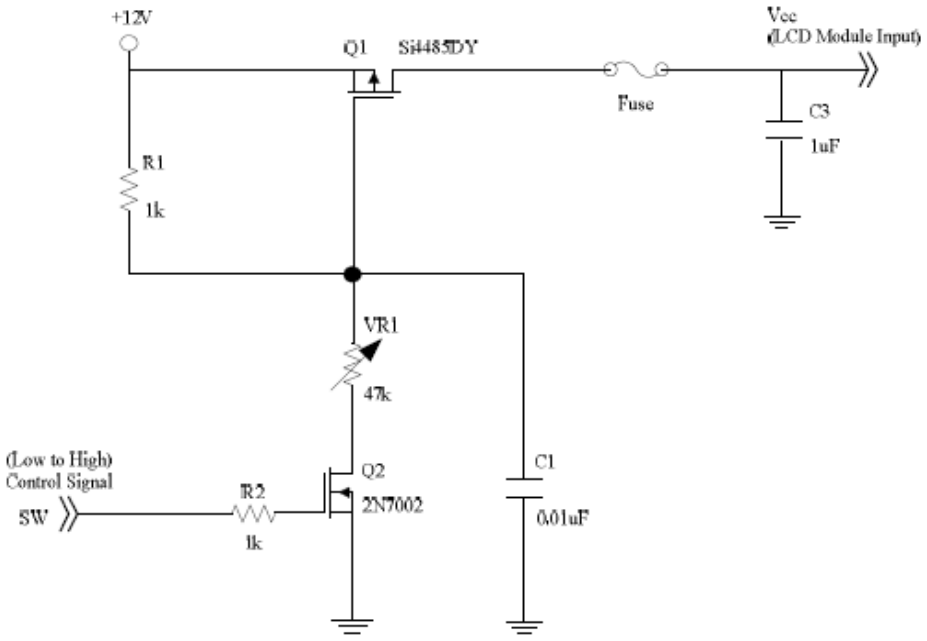
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	10.8	12	13.2	V	(1)
Rush Current		I_{RUSH}	-	-	4.3	A	(2)
Power Supply Current	White Pattern	-	-	0.84	1.1	A	(3)
	Vertical Stripe	-	-	0.83	-	A	
	Black Pattern	-	-	0.48	-	A	
LVDS interface	Common Input Voltage	V_{LVC}	1.125	1.25	1.375	V	
	Terminating Resistor	R_T	-	100	-	ohm	
CMOS interface	Input High Threshold Voltage	V_{IH}	2.7	-	3.3	V	
	Input Low Threshold Voltage	V_{IL}	0	-	0.7	V	

Note (1) The module should be always operated within the above ranges.

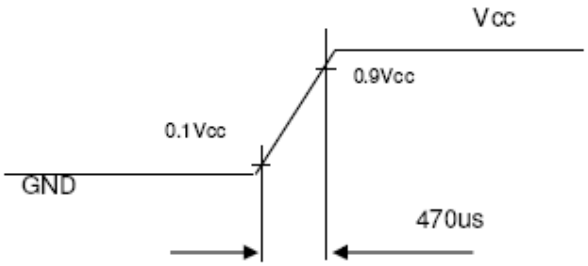
Note (2) Measurement condition:

Note (1) The module should be always operated within the above ranges.

Note (2) Measurement condition:



Vcc rising time is 470us



Note (3) The specified power supply current is under the conditions at Vcc = 12 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

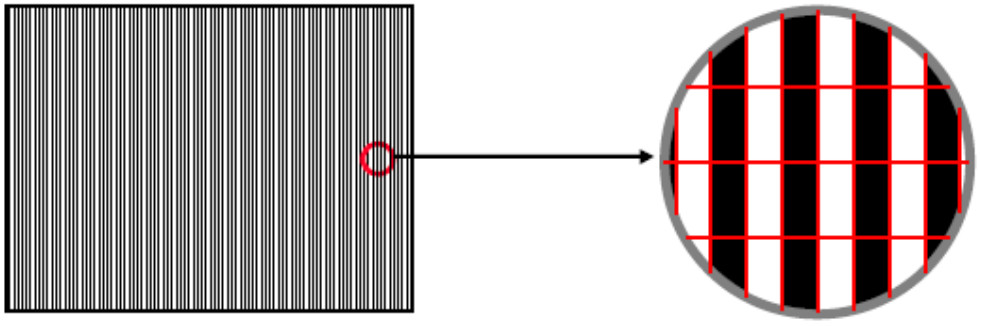
a. White Pattern

Active Area

b. Black Pattern

Active Area

c. Vertical Stripe Pattern



Active Area

3.2 Back Light Unit

CCFL(Cold Cathode Fluorescent Lamp) CHARACTERISTICS(Ta=25℃±2℃)

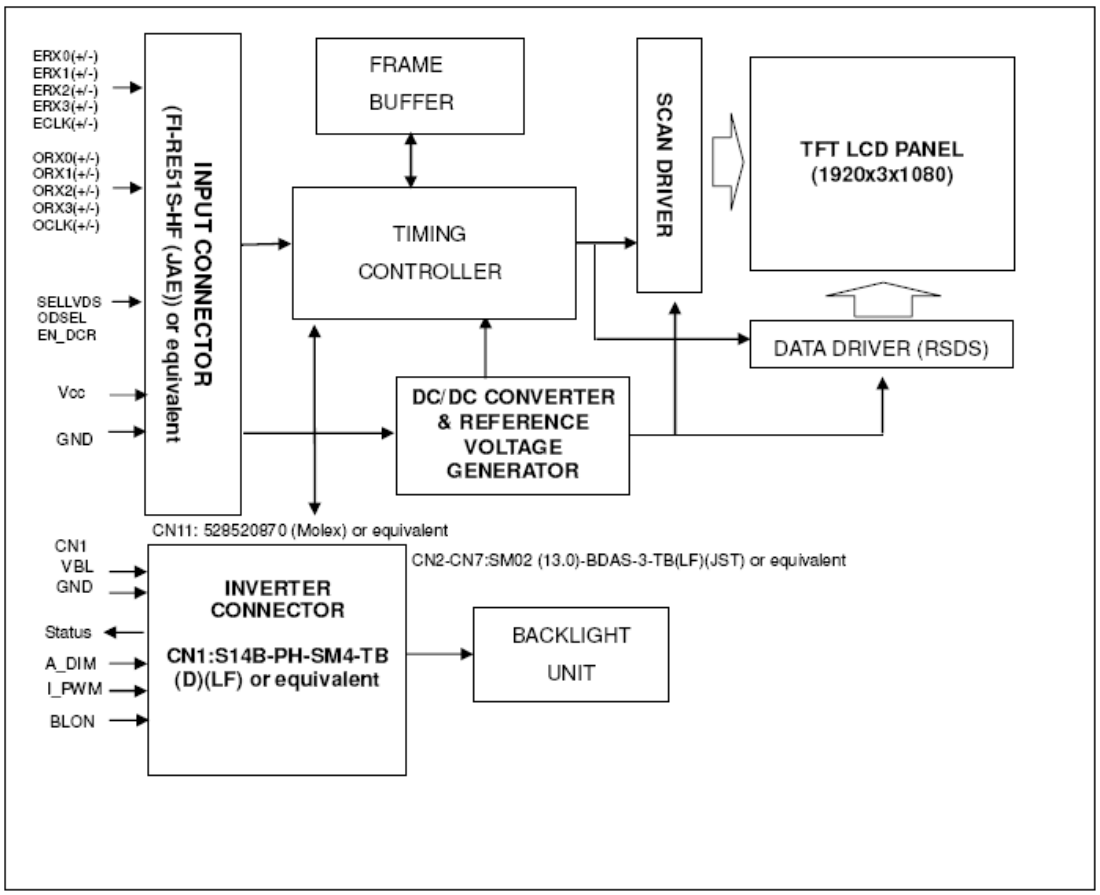
Parameter	Symbol	Value			Unit		Note
		Min.	Typ.	Max.			
Lamp Voltage	Vw	900	1050	1100	VRMS		
Lamp Current(HI-Side)	IL	9.5	10.5	11.5	mA		
Lamp Starting Voltage	Vs	-	-	1500	0℃	V	
		-	-	1300	25℃	V	
Operating Frequency	Fo	40	60	80	kHz		
Lamp Life Time	LBL	50,000			Hour		

3.3 Electrical specification

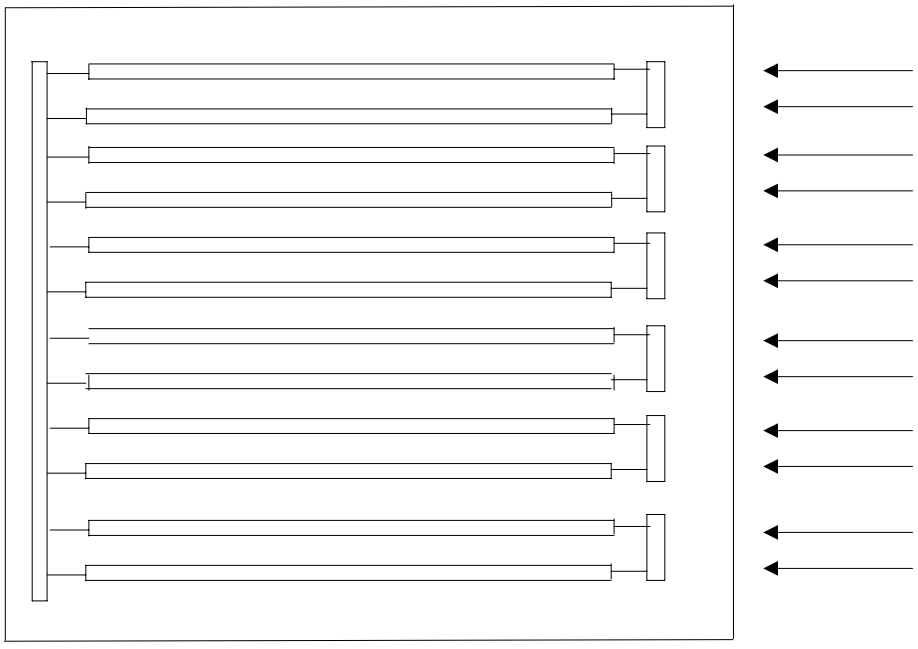
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Consumption	PBL		135		W	
Power Supply Voltage	VBL	90.0	220.0	264.0	V AC	
Power Supply Current	IBL		0.62		A	
Oscillating Frequency	FW	41.0	43.0	45.0	KHZ	
Dimming Frequency	FB	200	210	220	HZ	
Minimum Duty Ratio	DMIN		50		%	

4. BLOCK DIAGRAM

4.1 TFT Module



4.2 Back Light Unit



5. INTERFACE PIN ASSIGNMENT

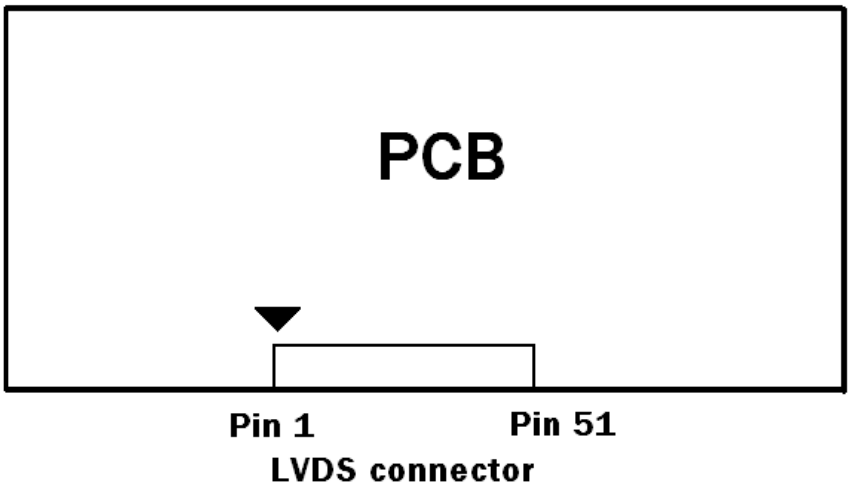
5.1 TFT-LCD MODULE

Table 5. MODULE CONNECTOR(CN1) PIN CONFIGURATION

Pin	Name	Description	Note
1	GND	Ground	
2	N.C.	No Connection	(2)
3	N.C.	No Connection	
4	N.C.	No Connection	
5	N.C.	No Connection	
6	N.C.	No Connection	
7	SELLVDS	LVDS data format Selection	(3)(5)
8	N.C.	No Connection	(2)
9	ODSEL	Overdrive Lookup Table Selection	(4)(6)
10	N.C.	No Connection	(2)
11	GND	Ground	
12	ERX0-	Even pixel Negative LVDS differential data input. Channel 0	(7)
13	ERX0+	Even pixel Positive LVDS differential data input. Channel 0	
14	ERX1-	Even pixel Negative LVDS differential data input. Channel 1	
15	ERX1+	Even pixel Positive LVDS differential data input. Channel 1	
16	ERX2-	Even pixel Negative LVDS differential data input. Channel 2	
17	ERX2+	Even pixel Positive LVDS differential data input. Channel 2	
18	GND	Ground	
19	ECLK-	Even pixel Negative LVDS differential clock input	(7)
20	ECLK+	Even pixel Positive LVDS differential clock input	
21	GND	Ground	
22	ERX3-	Even pixel Negative LVDS differential data input. Channel 3	(7)
23	ERX3+	Even pixel Positive LVDS differential data input. Channel 3	
24	N.C.	No Connection	(2)
25	N.C.	No Connection	
26	GND	Ground	
27	GND	Ground	
28	ORX0-	Odd pixel Negative LVDS differential data input. Channel 0	(7)
29	ORX0+	Odd pixel Positive LVDS differential data input. Channel 0	
30	ORX1-	Odd pixel Negative LVDS differential data input. Channel 1	
31	ORX1+	Odd pixel Positive LVDS differential data input. Channel 1	
32	ORX2-	Odd pixel Negative LVDS differential data input. Channel 2	
33	ORX2+	Odd pixel Positive LVDS differential data input. Channel 2	
34	GND	Ground	
35	OCLK-	Odd pixel Negative LVDS differential clock input.	(7)
36	OCLK+	Odd pixel Positive LVDS differential clock input.	
37	GND	Ground	
38	ORX3-	Odd pixel Negative LVDS differential data input. Channel 3	(7)
39	ORX3+	Odd pixel Positive LVDS differential data input. Channel 3	
40	N.C.	No Connection	(2)
41	N.C.	No Connection	
42	GND	Ground	
43	GND	Ground	
44	GND	Ground	
45	GND	Ground	
46	GND	Ground	
47	N.C.	No Connection	(2)

48	VCC	+12V power supply	
49	VCC	+12V power supply	
50	VCC	+12V power supply	
51	VCC	+12V power supply	

Note (1) LVDS connector pin orderdefined as follows



Note (2) Reserved for internal use. Please leave it open.

Note (3) Low = Open or connect to GND: VESA Format, High = Connect to +3.3V: JEIDA Format.

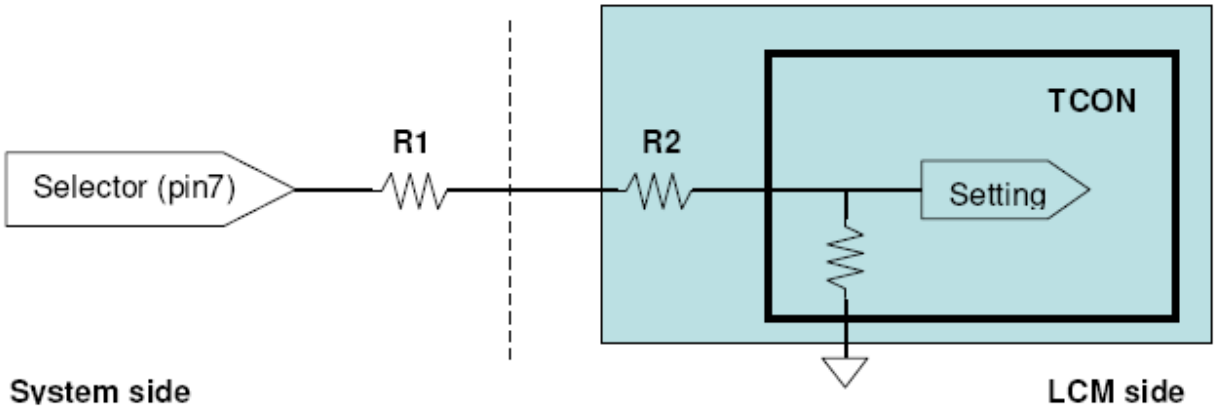
Note (4) Overdrive lookup table selection. The overdrive lookup table should be selected in accordance with the frame rate to optimize image quality.

Low = Open or connect to GND, High = Connect to +3.3V

ODSEL	Note
L or open	Lookup table was optimized for 60 Hz frame rate.
H	Lookup table was optimized for 50 Hz frame rate.

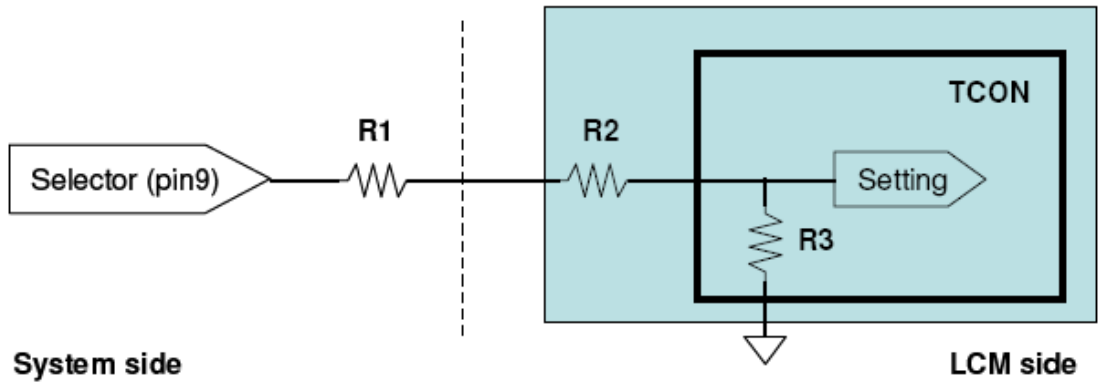
Note (5) LVDS signal pin connected to the LCM side has the following diagram.

R1 in the system side should be less than 1K Ohm. (R1 < 1K Ohm)



System side: R1 < 1K

Note (6) ODSEL signal pin connected to the LCM side has the following diagram.
R1 in the system side should be less than 1K Ohm. (R1 < 1K Ohm)



Note (7) Two pixel data send into the module for every clock cycle. The first pixel of the frame is odd pixel and the second pixel is even pixel.

5.2 POWER UNIT

5.2.1 XP802 : TJC10-14A

NO.	NAME	FUNCTION
1-2	M5V	MAIN 5V
3-4	GND	GND
5	SW	背光源开关信号（高电平开）
6	BRI	调光信号
7	GND	GND
8 – 9	12V	12V
10-11	S5V	待机 5V
12	STB	待机信号（高电平开机）
13-14	GND	GND

5.2.2 XP809 : TJC10-13

NO.	NAME	FUNCTION
1-2	14V	伴音 14V
3-4	GND	GND
5	12V	12V
6	GND	GND
7	M5V	主 5V
8 – 9	GND	GND
10 – 11	M5V	主 5V
12 – 13	GND	GND

5.2.3 XP901 : TJC10-4A

NO.	NAME	FUNCTION
1	GND	GND
2	Isen	灯管电流反馈
3	PS	灯管高呼信号
4	GND	GND

5.2.4 XP900 : TJC10-14A

NO.	NAME	FUNCTION
1-5	TA	逆变交流输出 A
6	NC	空脚
7-8	GND	GND
9	NC	空脚
10-14	TB	逆变交流输出 A

5.2.5 XP801 : VH-3A-2

NO.	NAME	FUNCTION
1	L	交流电源输入
2	N	交流电源输入

5.3 RELATIONSHIP BETWEEN DISPLAY COLORS AND INPUT SIGNALS

The brightness of each primary color(red,green,blue) is based on the 10-bit gray scale data input for the color. The higher binary input, the brighter the color. Table 6 provides a reference for color versus data input.

Table 6. COLOR DATA REFERENCE

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red (0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	Red (253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green (0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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	Green (253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green (254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue (0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	Blue (253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue (254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

5.4. Signal Timing Specifications

Table 7 shows the signal timing required at the input of the LVDS transmitter. All of the interface signal timing should be satisfied with the following specification for normal operation.

(Ta = 25 ± 2 ºC)

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Receiver Clock	Frequency	1/Tc	60	74.25	80	MHz	-
	Input cycle to cycle jitter	Trcl	-	-	200	ps	-
LVDS Receiver Data	Setup Time	Tlvsu	600	-	-	ps	-
	Hold Time	Tlvhd	600	-	-	ps	-
Vertical Active Display Term	Frame Rate	Fr5	47	50	53	Hz	(1)
		Fr6	57	60	63	Hz	(1)
	Total	Tv	1115	1125	1135	Th	Tv=Tvd+Tvb
	Display	Tvd	1080	1080	1080	Th	-
	Blank	Tvb	35	45	55	Th	-
Horizontal Active Display Term	Total	Th	1050	1100	1150	Tc	Th=Thd+Thb
	Display	Thd	960	960	960	Tc	-
	Blank	Thb	90	140	190	Tc	-

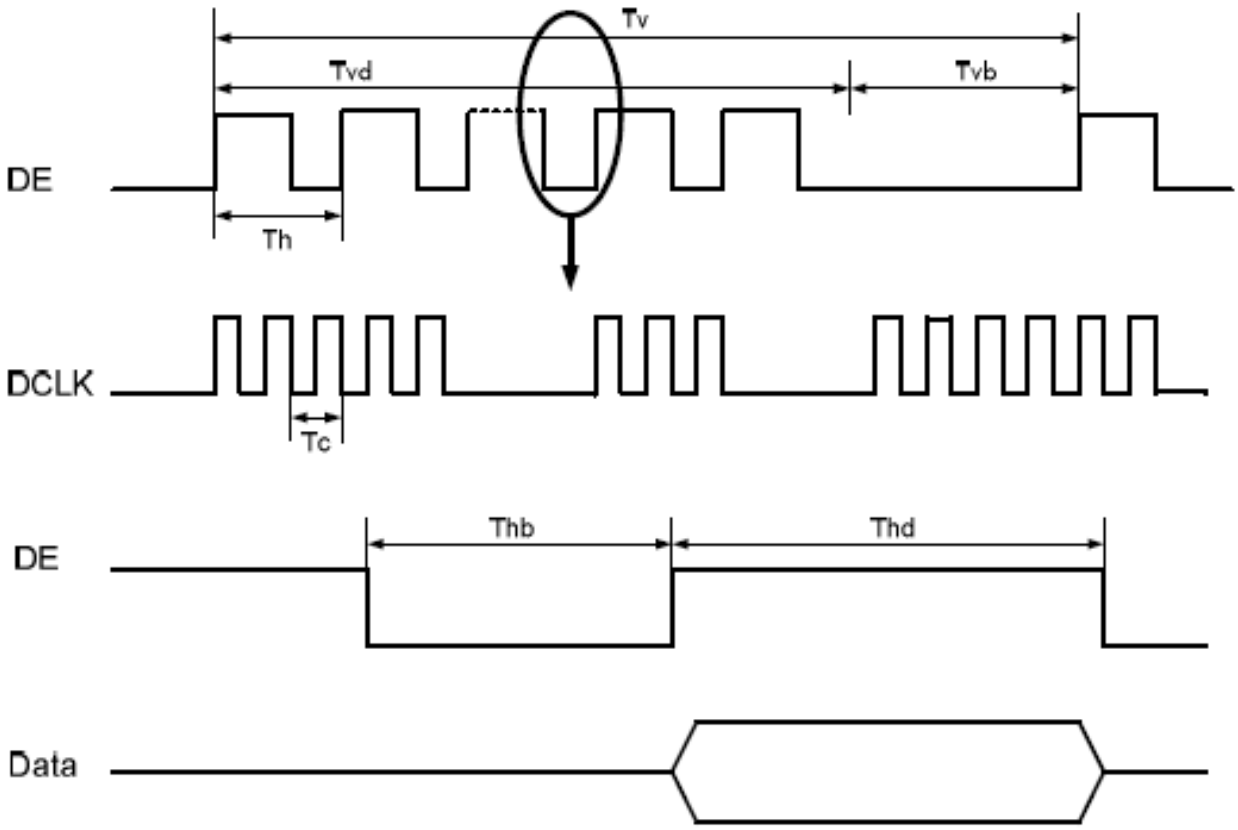
Note (1) : (ODSEL) = (H) , (L). Please refer to 5.1 for detail information

Note (2) : Since the module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this module would operate abnormally.

6. INTERFACE TIMING

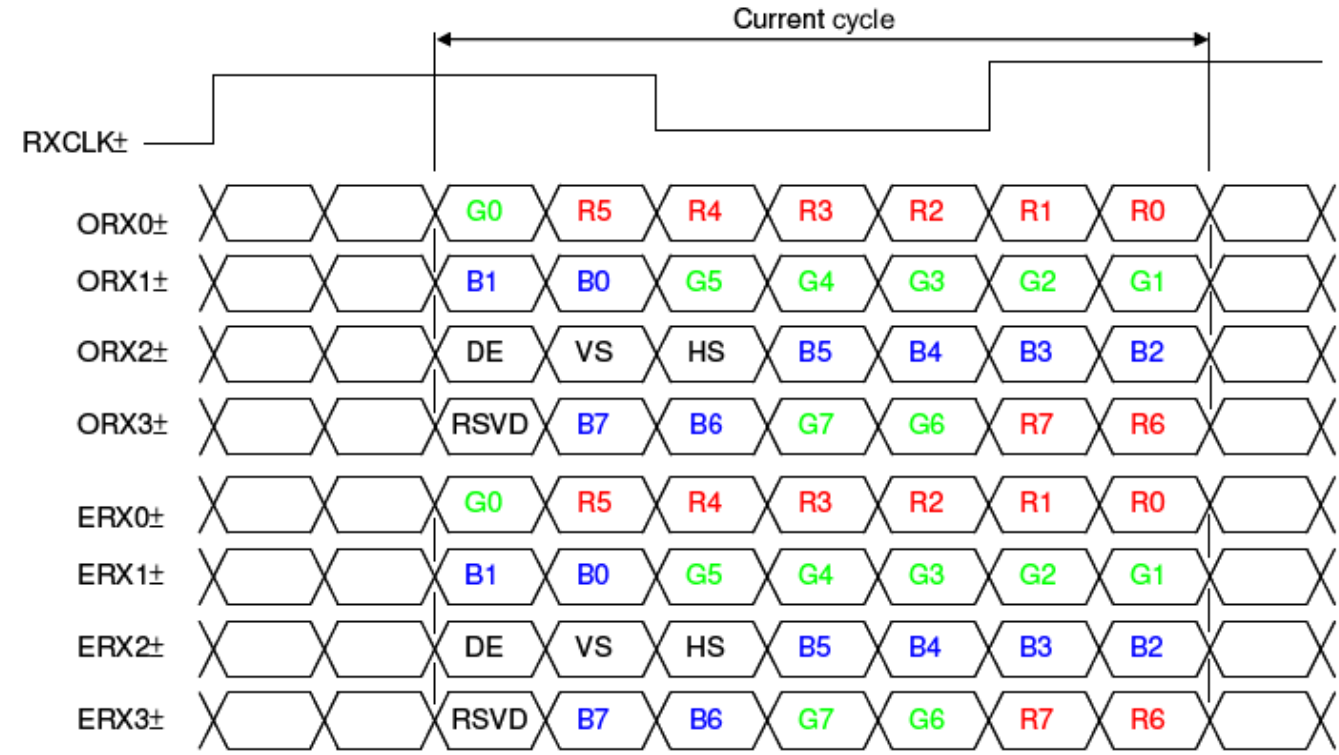
6.1 Signal Timing Waveforms

INPUT SIGNAL TIMING DIAGRAM

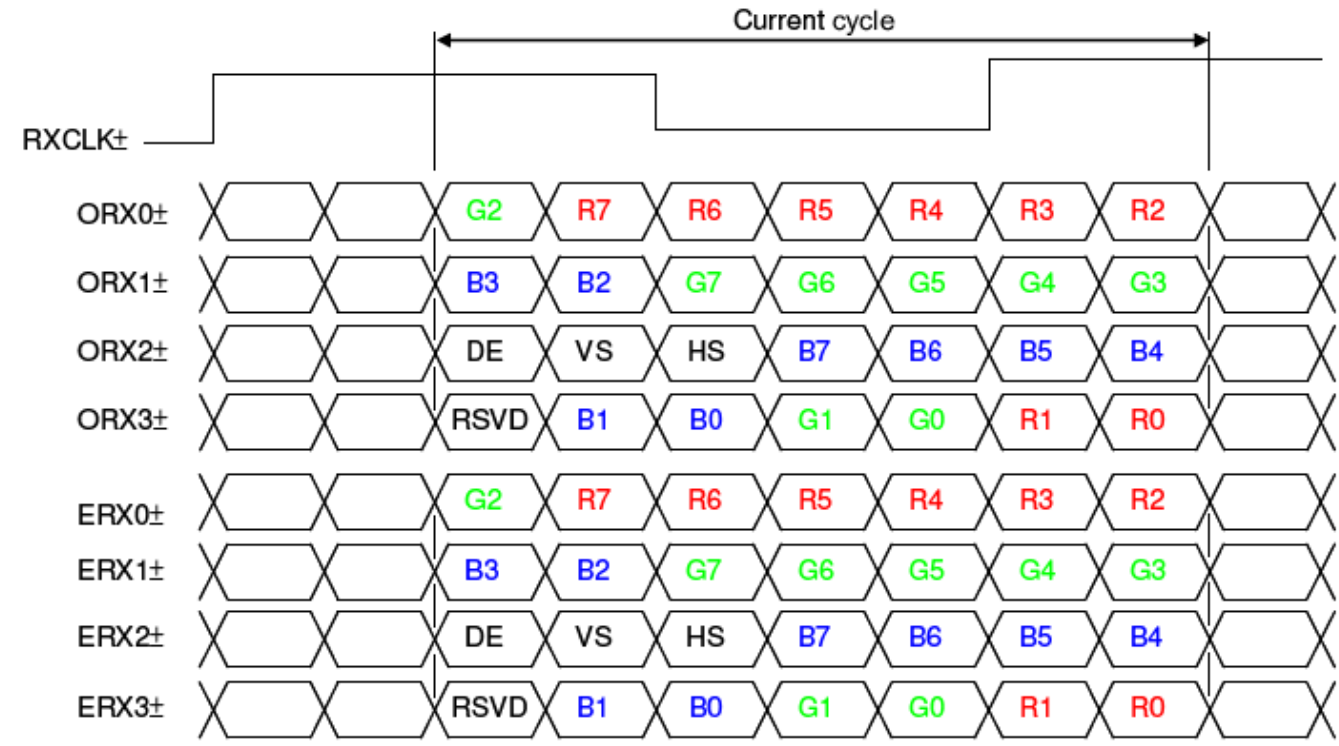


6.2 LVDS INTERFACE

VESA LVDS format：(SELLVDS pin=L)



JEDIA LVDS format：(SELLVDS pin=H)



R0~R7: Pixel R Data (7; MSB, 0; LSB)

G0~G7: Pixel G Data (7; MSB, 0; LSB)

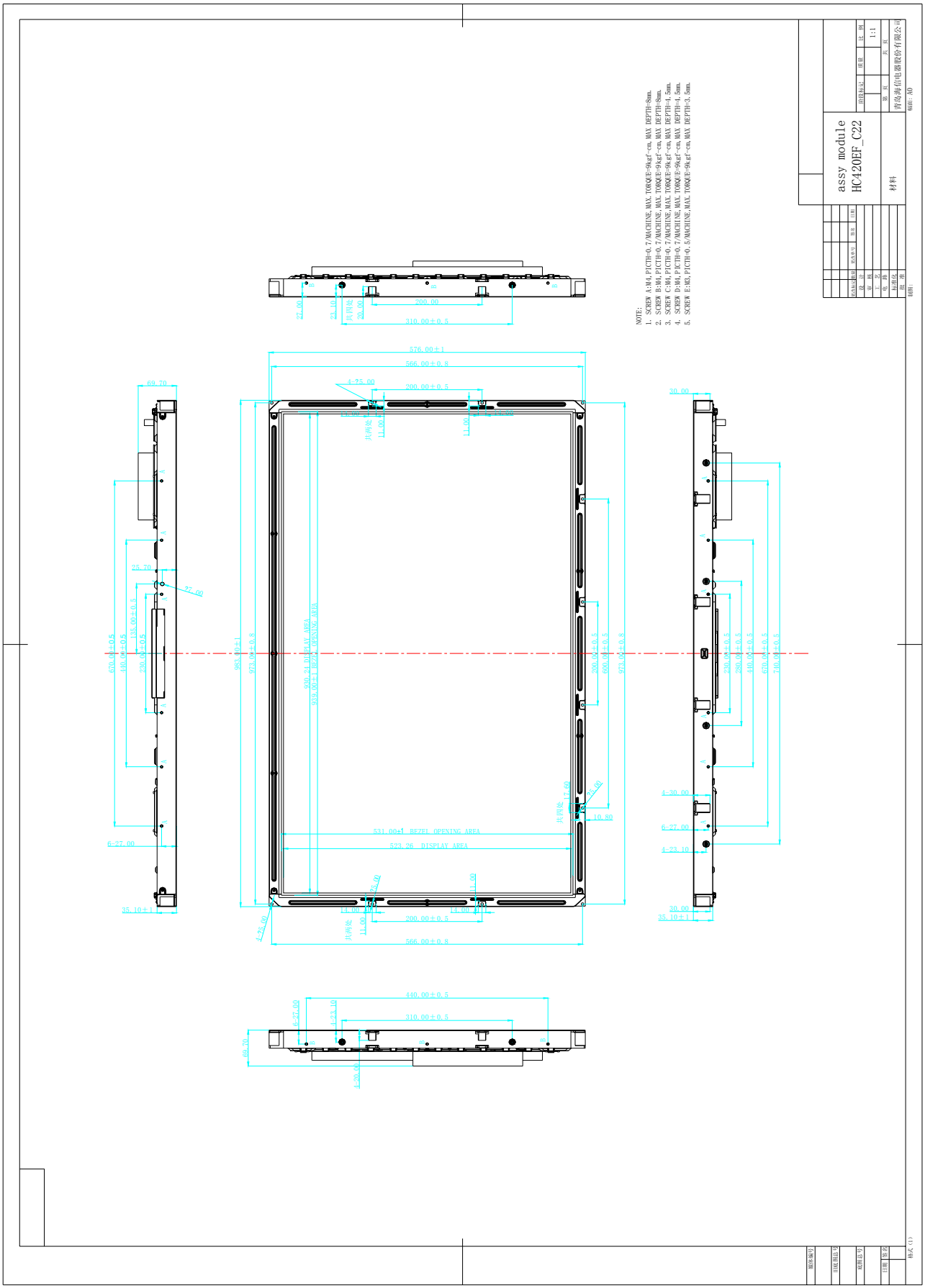
B0~B7: Pixel B Data (7; MSB, 0; LSB)

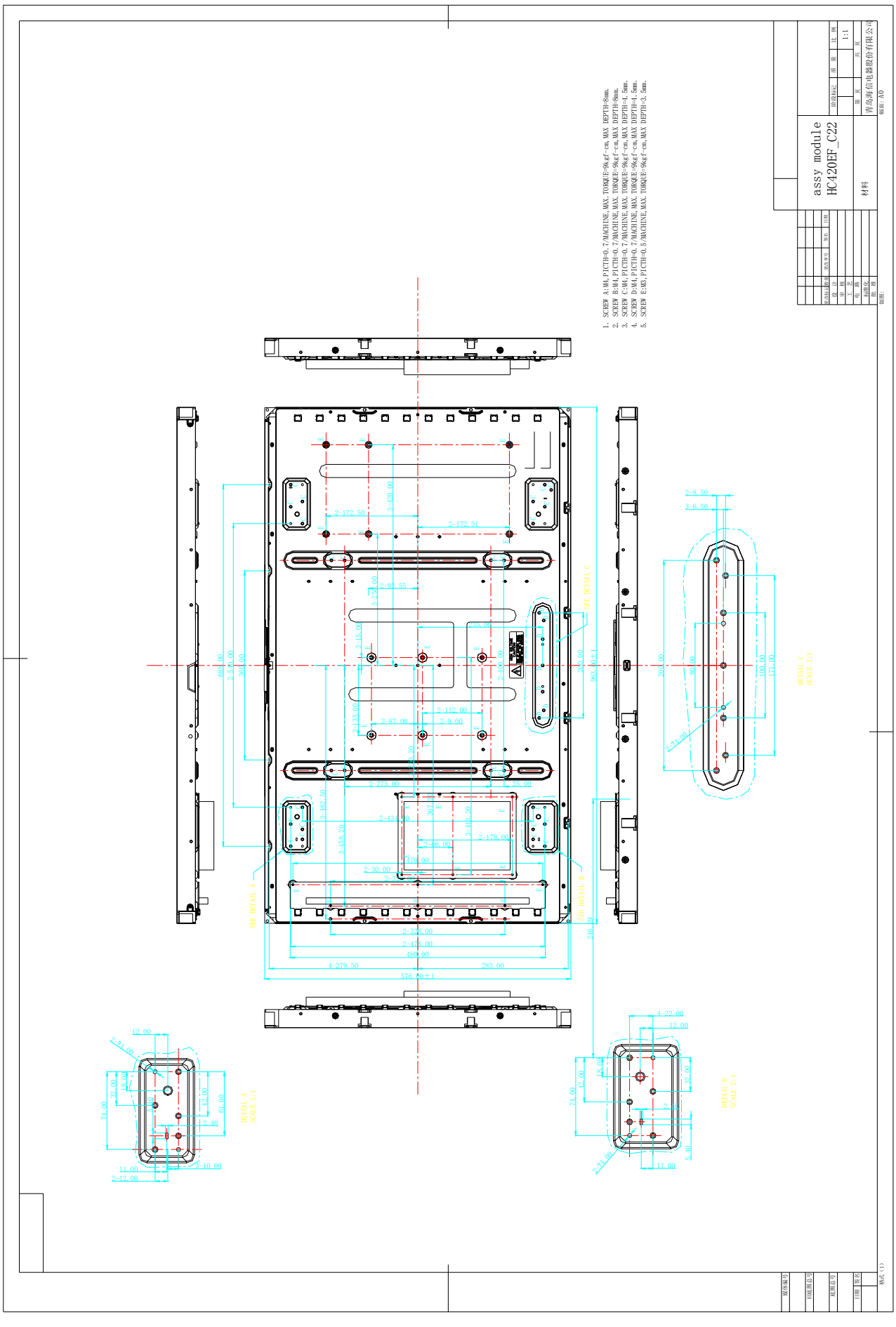
DE : Data enable signal

DCLK : Data clock signal

Notes: (1) RSVD (reserved) pins on the transmitter shall be “H” or “L”.

7. MECHANICAL CHARACTERISTICS



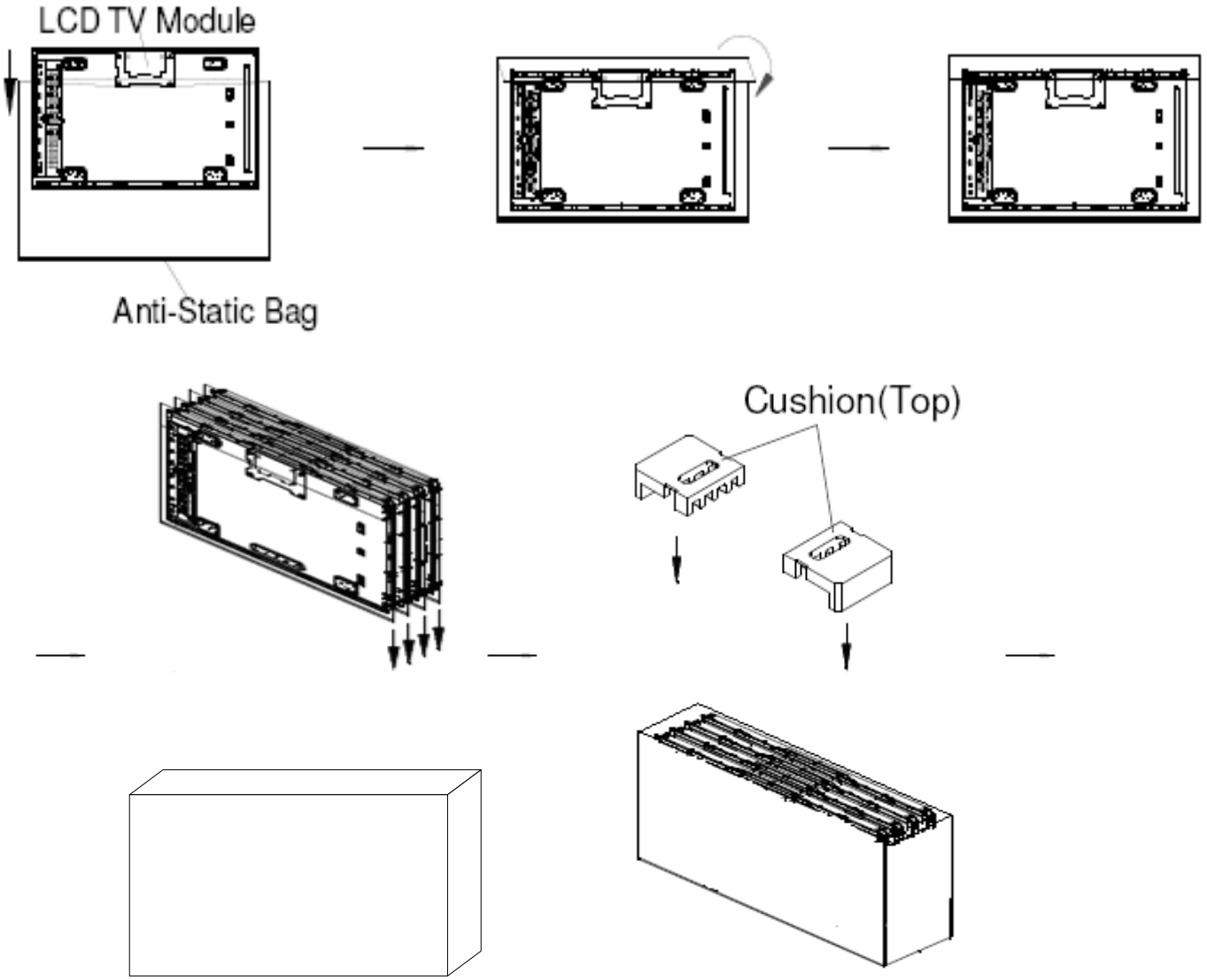

1. SCREW A:M4 PITCH=0.7 MACHINE, MAX. TORQUE=9kgf-cm, MAX DEPTH=8mm.
2. SCREW B:M4 PITCH=0.7 MACHINE, MAX. TORQUE=9kgf-cm, MAX DEPTH=8mm.
3. SCREW C:M4 PITCH=0.7 MACHINE, MAX. TORQUE=9kgf-cm, MAX DEPTH=4.5mm.
4. SCREW D:M4 PITCH=0.7 MACHINE, MAX. TORQUE=9kgf-cm, MAX DEPTH=4.5mm.
5. SCREW E:M3 PITCH=0.5 MACHINE, MAX. TORQUE=9kgf-cm, MAX DEPTH=3.5mm.
assy module
HC420EF_C22
材料
青岛海信电器股份有限公司
SEE DETAIL A
SEE DETAIL B
SEE DETAIL C
DETAIL A SCALE 2:1
DETAIL B SCALE 2:1
DETAIL C SCALE 2:1

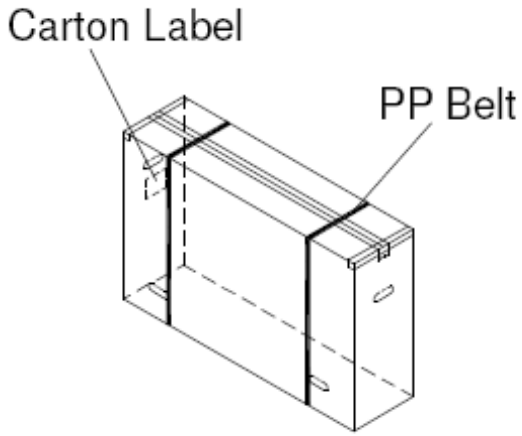
8. PACKAGING

8.1 PACKAGING SPECIFICATION

(1) 4 LCD TV modules / 1 Box
(2) Box dimensions : 1047(L)x358(W)x638(H)mm
(3) Weight : Approx. 50Kg(4 modules per carton)

8.2 PACKAGING METHOD




Carton Label
PP Belt

9. PRECAUTIONS

9.1 ASSEMBLY AND HANDLING PRECAUTIONS

1) Do not apply rough force such as bending or twisting to the module during assembly.

2) It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

3) Do not apply pressure or impulse to the module to prevent the damage of LCD panel and backlight.

4) Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.

5) Do not plug in or pull out the I/F connector while the module is in operation.

6) Do not disassemble the module.

7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

8) Moisture can easily penetrate into LCD module and may cause the damage during operation.

9) High temperature or humidity may deteriorate the performance of LCD module. Please store LCD modules in the specified storage conditions.

10) When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.

9.2 SAFETY PRECAUTIONS

1) The startup voltage of a backlight is over 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the backlight unit.

2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

3) After the module's end of life, it is not harmful in case of normal operation and storage.

9.3 STORAGE PRECAUTIONS

When storing modules as spares for a long time, the following precaution is necessary. 1) Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35℃at normal humidity without condensation.

2) The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.